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BULLETIN NO. 11.

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U. S. DEPARTMENT OF AGRICULTURE

DIVISION OF BIOLOGICAL SURVEY

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THE

Geographic Distribution of Cereals in North America

UNIVERSITY OF MICHIGAN

Economics

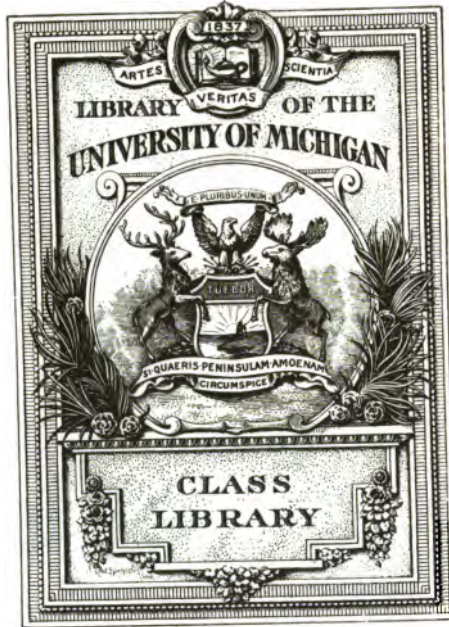
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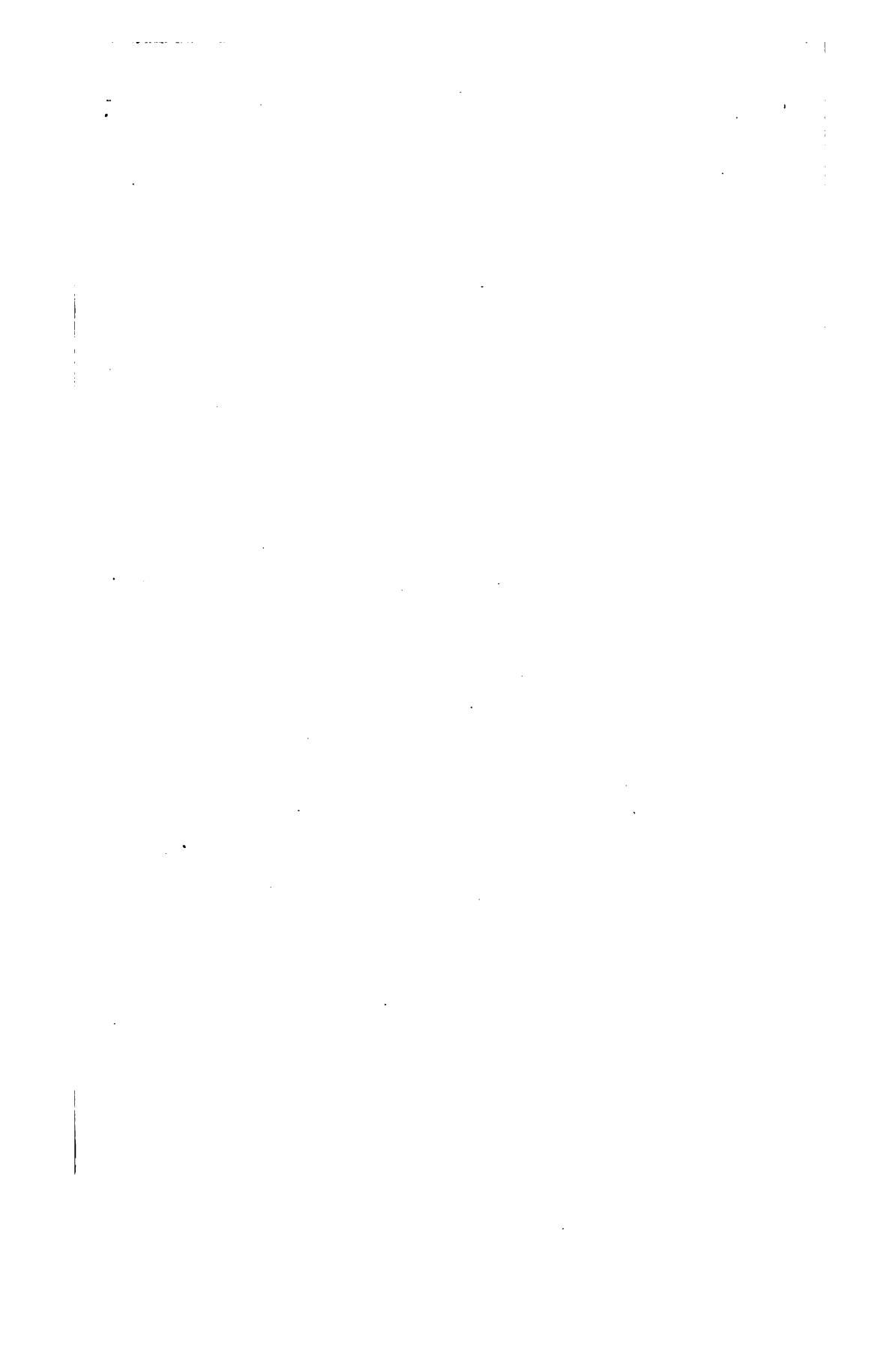
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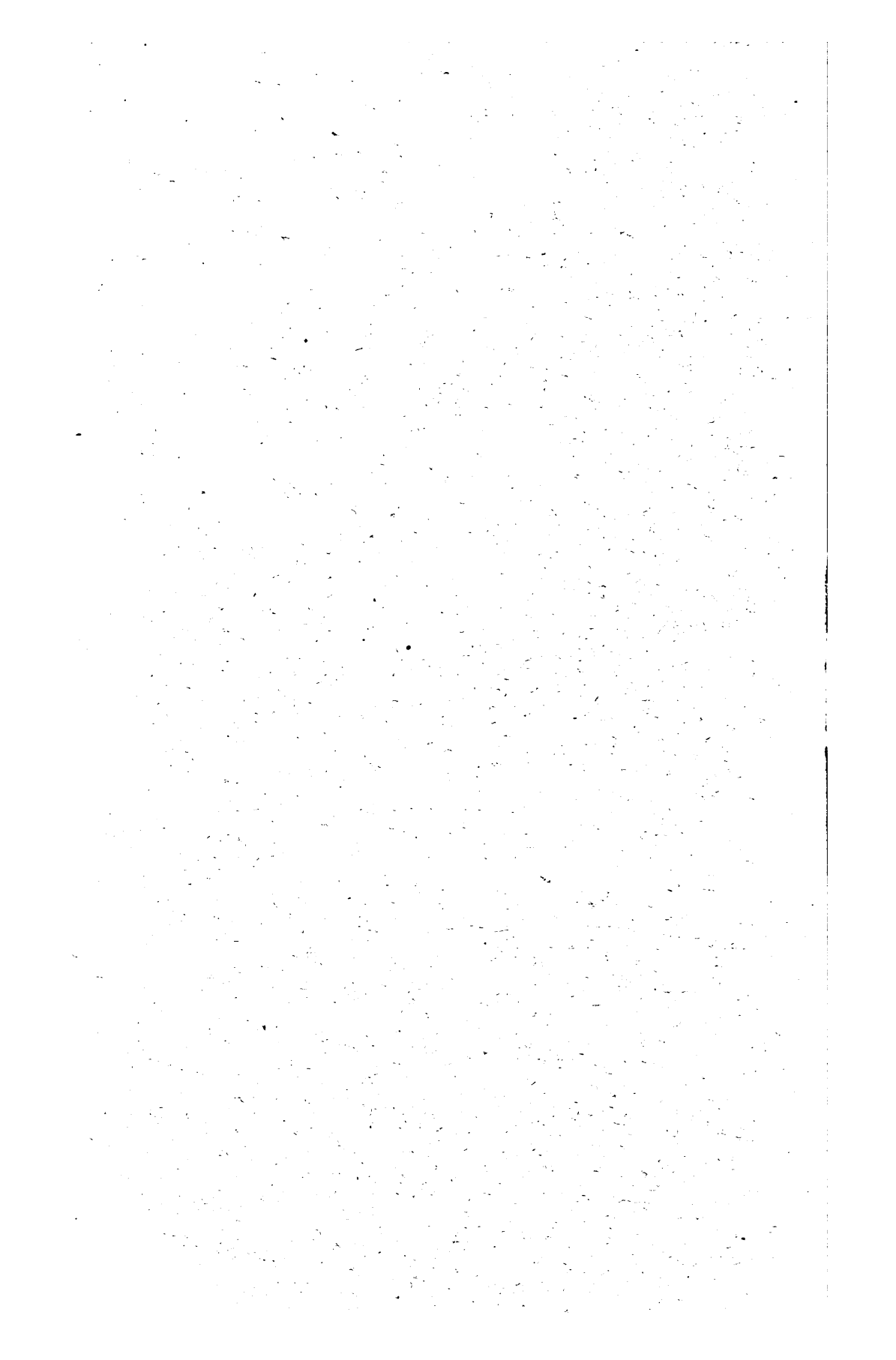
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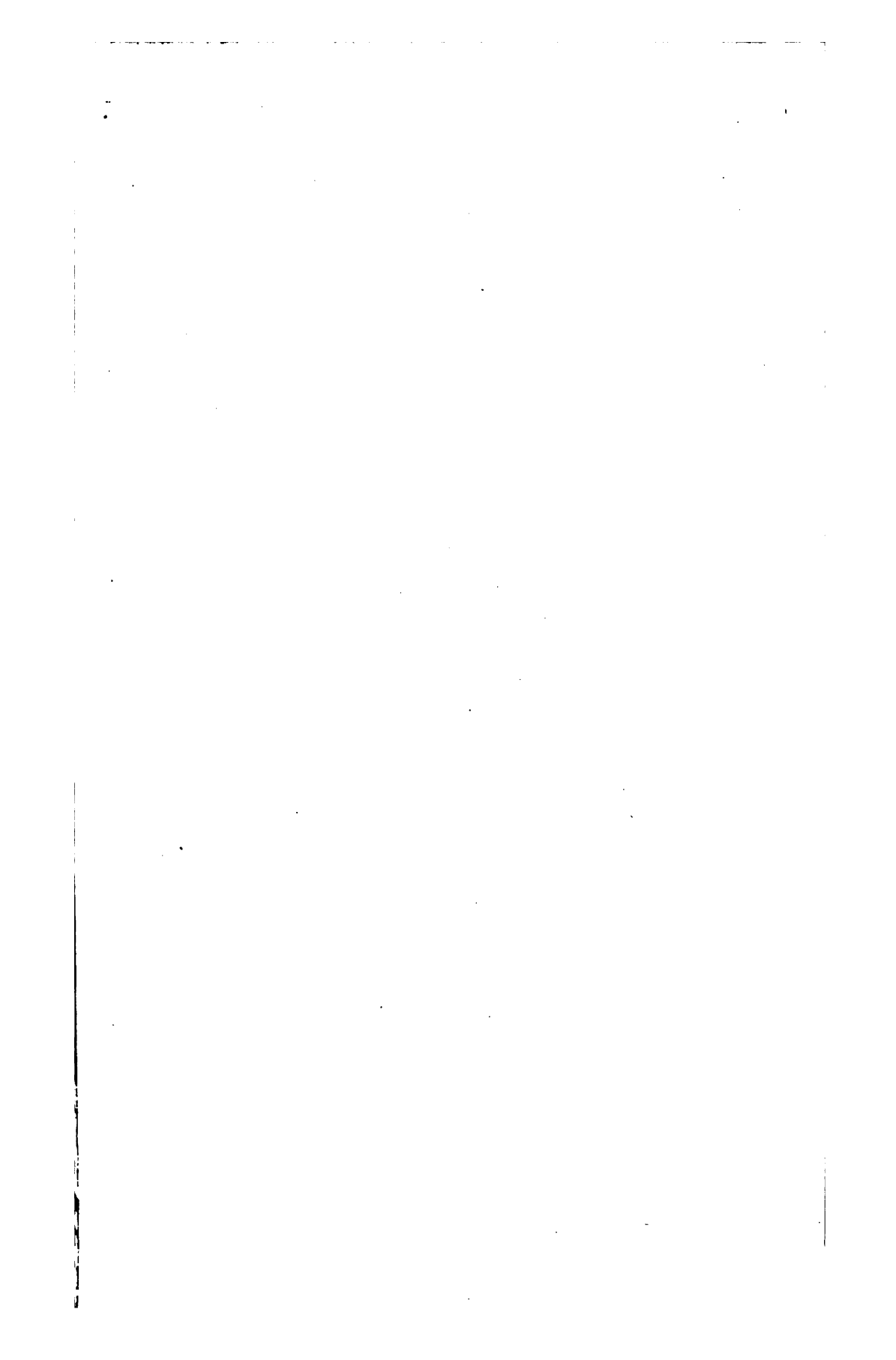
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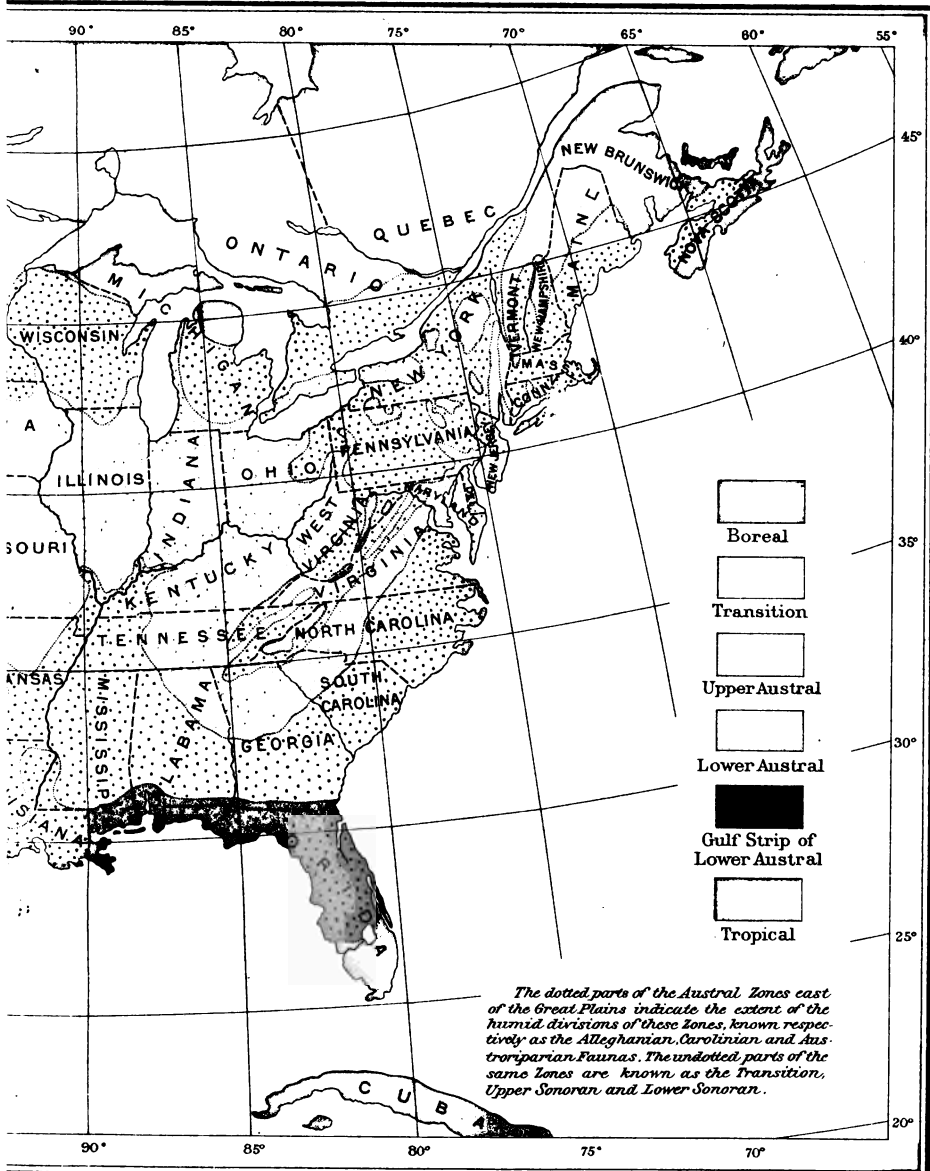
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LIFE ZONES OF THE



JULIUS BIEN & CO. N.Y.

EASTERN UNITED STATES

BY
FERRIAM.

BULLETIN No. 11.

U. S. DEPARTMENT OF AGRICULTURE
DIVISION OF BIOLOGICAL SURVEY

THE

Geographic Distribution of Cereals in North America

BY

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Accession 187

PREPARED UNDER THE DIRECTION OF
DR. C. HART MERRIAM
CHIEF OF BIOLOGICAL SURVEY



WASHINGTON
GOVERNMENT PRINTING OFFICE
1898

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 SIR: I have the honor to transmit herewith, for publication as Bulletin No. 11 of the Biological Survey, a report on 'The Geographic Distribution of Cereals in North America,' by Prof. C. S. Plumb, the result of an investigation made under an authorization of the Secretary of Agriculture under date of January 2, 1897. The object of the inquiry was to ascertain the areas in which the more important varieties of certain cereals were cultivated and to determine how far the distribution of cereals accords with the boundaries of the life zones as mapped by the Biological Survey.

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Hon. JAMES WILSON,
Secretary of Agriculture.

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THE GEOGRAPHIC DISTRIBUTION OF CEREALS IN NORTH AMERICA.

INTRODUCTION.

Through the assistance of the experiment stations in the United States and Canada, and in a few cases through secretaries of boards of agriculture, were secured the addresses of about twenty-five hundred intelligent corn, wheat, and oat growers throughout the two countries. To each of these persons was sent a circular letter explaining the object of the inquiry, and requesting that the blanks on the form accompanying the letter be filled out with the names of not more than ten well-established varieties each of corn, wheat, and oats which were grown most successfully in the neighborhood reported on, together with a statement as to how long the variety had been known, the average yield, and whether it succeeded best on lowland or upland.

Of the 1,033 reports received, 897 came from the United States, (representing all the States and Territories), and 136 from the Canadian provinces of British Columbia, Alberta, Saskatchewan, Assiniboia, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island. A large percentage of the replies were very intelligently made, and many blanks were completely and carefully filled.

These reports showed that in many localities but little attention was given to keeping varieties pure, and many farmers used mixed, unknown, or local varieties of ordinary merit for seed. In the East and South this was more frequently the case than in the Central, Northern, and Western States, or in the Canadian provinces. In most of the Eastern and Southern States, as compared with the rest of the country, grain growing is not an important industry. In New England but little grain is grown for seed, owing to the cheapness of Western grain, and wheat was rarely reported. Oats are now mostly sown from Western seed, the resulting crop being mown for hay, while much of the corn is cut for green fodder or silage. On certain fine lowlands, as, for example, in the Connecticut Valley, oats, and more especially corn, are often grown for grain.

While reports on most of the cereals were rendered from the Lower Austral zone,¹ this region, except where it merges with the Upper

¹North America is divisible into seven transcontinental belts or life zones, each characterized by particular associations of animals and plants and suited for special crops. These zones are: The Arctic-Alpine, Hudsonian, Canadian, Transition, Upper Austral, Lower Austral, and Tropical. The Transition, Upper and Lower Austral are the ones most frequently referred to in this bulletin (see frontispiece). The Life Zones and Crop Zones of the United States are described in detail in Bulletin No. 10 of the Biological Survey.

Austral, is apparently outside the area of profitable cultivation of wheat and oats. In Louisiana wheat is almost an unknown crop, and the same may be said of most other parts of the Lower Austral, except in northern Texas and Oklahoma. The warm, moist summer climatic conditions here favor the development of fungous diseases to such a degree that the plants are usually ruined or greatly injured at an early stage of growth. In Florida, as a rule, cereals are rarely cultivated, except on the uplands at the northern end of the State. Both corn and oats make an unsatisfactory growth compared with that in the Upper Austral, while wheat is not grown at all on a commercial scale.

The only class of oats that yield crops of any consequence in the oat-growing territory in the Lower Austral zone are the so-called rust-proof varieties, chief among which is the Texas Red Rust Proof, commonly grown in all the Gulf States.

In a general way, corn and wheat are most successfully grown in the Upper Austral zone, while oats are best and most productive in the Transition zone, or along the border of the Upper Austral and the Transition.

The gradual acclimation of varieties of cereals, through years of selection and cultivation, has gone so far, however, that some varieties are now much better adapted to one zone than to another. The Flint corns come to their best development in the higher Upper Austral and Transition, while Mosby's Prolific of the Dents clings close to the Lower Austral. Burt oats thrive best in the higher Lower Austral, while Black Tartarian reaches greatest perfection in the Transition. These examples are given simply to show the adaptability of varieties to certain zones.

GEOGRAPHIC DISTRIBUTION.

In the following discussion only those varieties are included which are recognized as standard ones by seedsmen and grain growers generally. Many others were reported on, but in no instance were enough returns received concerning any one to justify mapping its geographic distribution. It is but fair to assume that the reports represent the relative importance of the different varieties over the country in general. It is not intended, however, that the impression shall be created that many of them will or will not thrive in localities from which no reports have been received. It is believed that enough facts have been secured to demonstrate that, in their present stage of development, the varieties here mentioned are better suited to successful cultivation in the zones from which they are favorably reported than in other areas.

A discussion of each variety follows, based on a careful study of a map showing its distribution and data concerning its maturing or productive powers in the regions where grown. On the basis of this evidence it is believed that the varieties may be classified according to their adaptability to successful culture in the several life zones.

The following table has been prepared to show the zones in which each variety of corn, wheat, and oats reported on seems to be best adapted.¹ A list of the varieties of cereals specially adapted to each zone is given in the table on page 22.

Distribution of Cereals in North America, by Varieties.

Cereal.	Group.	Variety.	Zone.
Corn.....	(a) Flint	Angel of Midnight	Transition and upper edge of Upper Austral.
		Canadian Eight-rowed Yellow.	Transition and upper edge of Upper Austral.
		King Philip	Transition and upper edge of Upper Austral.
		Longfellow	Transition and upper edge of Upper Austral.
		Bloody Butcher.....	Upper Austral.
		Golden Dent.....	Lower Austral and lower edge of Upper Austral.
	(b) Dent	Hickory King	Upper Austral and upper part of Lower Austral.
		Leaming.....	Upper Austral.
		Mosby's Prolific.....	Lower Austral.
		Pride of the North.....	Transition.
		St. Charles White.....	Upper Austral.
		White Gourd Seed.....	Where Upper and Lower Austral blend.
	(c) Soft	Squaw	Transition.
	(d) Sweet	Stowell's Evergreen.....	Upper Austral.
	(e) Pop	All varieties	Upper Austral.
		Clawson	Transition and Upper Austral.
	(a) Winter.....	Fulcaster	Upper Austral.
		Fultz	Upper Austral.
		May	Lower Austral and lower edge of Upper Austral.
		Mediterranean.....	Upper Austral.
Wheat.....	(b) Spring	Turkey Red	Upper Austral.
		Velvet Chaff.....	Upper Austral.
		Australian	Lower and Upper Austral.
		Ladoga	Transition.
		Saskatchewan Fife	Transition.
		Scotch Fife. Fife	Transition.
	(a) Open panicle....	Sonora	Upper and Lower Austral.
		Red Fife	Transition.
		American Banner.....	Transition.
		Lincoln	Transition and Upper Austral.
Oats	(a) Open panicle....	Welcome	Transition and Upper Austral.
		Burt	Lower Austral.
		Red Rust Proof.....	Where Upper Austral and Lower Austral blend.
		White Russian	Transition and Upper Austral.
	(b) Closed panicle....	Black Tartarian	Transition.

CORN.

Indian corn is known botanically as *Zea mays* Linn. The varieties of this species are many, and may be subdivided into five principal groups, viz: Flint, Dent, Soft, Sweet, and Pop. There is one other group, known as *Pod* corn, which, however, does not find a place in our agriculture. Sturtevant also places in a group by itself, under the name of Starchy Sweet corns, the varieties grown by the Indians of Arizona, New Mexico, and Mexico. In this report are considered only the Flint, Dent, Soft, Sweet, and Pop varieties. For convenience, each is placed in its proper group, and discussed separately.

¹ No doubt occasionally varieties were incorrectly named by correspondents, but such errors are probably so small as not to be worthy of serious consideration.

GROUPS AND VARIETIES.

(a) FLINT CORN.

- (1) *Angel of Midnight*.
- (2) *Canadian Eight-rowed Yellow*.
- (3) *King Philip*.
- (4) *Longfellow*.

(b) DENT CORN.

- (5) *Bloody Butcher*.
- (6) *Golden Dent*.
- (7) *Hickory King*.
- (8) *Leaming*.
- (9) *Mosby's Prolific*.

(b) DENT CORN—Continued.

- (10) *Pride of the North*.
- (11) *St. Charles White*.
- (12) *White Gourd Seed*.

(c) SOFT CORN.

- (13) *Squaw*.

(d) SWEET CORN.

- (14) *Stowell's Evergreen*.

(e) POP CORN.

- (15) *All varieties*.

NOTES ON THE GROUPS AND VARIETIES.

The geographic distribution of the above-mentioned varieties is given in order, as follows:

(a) FLINT CORN.

Flint corn comprises a comparatively small amount of the corn of commerce, and is generally grown in the Transition zone in the Northeastern States and Canada.

(1) *Angel of Midnight*.—Reported by twenty-four persons as growing and maturing grain in Colorado, Connecticut, Massachusetts, New York, Rhode Island, Utah, Vermont, Wisconsin, and Ontario. It is also reported as grown for green fodder in British Columbia, Saskatchewan, New Brunswick, Nova Scotia, and Manitoba, where it will not mature seed. It is commonly grown in Massachusetts and Connecticut, but elsewhere only in widely separated localities. All reports where it matures are from points in the Transition zone and in the higher limits of the Upper Austral.

(2) *Canadian Eight-rowed Yellow*.—This is also known as Canada Yellow, Canadian Yellow, Early Canada, etc. Thirty-eight persons report this variety, or one closely related to it, as growing in all the New England States, in Missouri, Nevada, Ohio, Pennsylvania, Utah, Washington, Ontario, Quebec, and New Brunswick. It is, however, a standard stock corn of New England and the eastern Canadian provinces, and, in some cases, has been grown in the Northeast for nearly a century. While it will yield satisfactory crops in the upper edge of the Upper Austral, it is essentially a plant of the Transition zone. The one report from Missouri probably names the variety incorrectly.

(3) *King Philip*.—This variety was first distributed in the United States in 1852, and is to-day one of the best-known Flint varieties, being extensively grown in the Northeastern States, where it is highly regarded. Forty-six correspondents report it as growing in nineteen States and in the Province of Ontario. It is widely scattered (in the Transition and to some extent in the Upper Austral zones) from the

Atlantic to the Pacific. Besides the New England States, it is reported from northern New Jersey, Pennsylvania, New York, southern Michigan, Wisconsin, and from one point each in northern Missouri, central Kansas, North Dakota, South Dakota, Colorado, and Idaho. It grows in California near the coast at a number of points in the Upper Austral zone and at one point in the Transition; at four points in the Transition in Oregon and one point in Colorado. In Minnesota it is reported entirely from the Transition, while in Utah reports are from both the Upper Austral and Transition zones. The Ontario reports are from the Upper Austral.

(4) *Longfellow*.—This variety has been known in New England for nearly sixty years, and is a favorite, being generally cultivated all over that section. It is also reported maturing seed in northern Colorado, Utah, Idaho, North Dakota, Minnesota, Wisconsin, Pennsylvania, and northern New Jersey. These localities are nearly all in the Transition zone, except in the Connecticut Valley, and possibly one point in Venango County, Pa., which are in the Upper Austral. Reports from Manitoba, Nova Scotia, and British Columbia state that it is only grown for green fodder. Reports from Ontario, Quebec, and New Brunswick give yields of grain in the Transition zone ranging from 30 to 90 bushels per acre. Generally speaking, it is a variety of the Transition zone, and also of the edge of the Upper Austral.

(b) DENT CORN.

(5) *Bloody Butcher*.—Forty-five persons report this variety from thirteen States and Territories, mainly in the central West, and with slight exception, entirely in the Upper Austral. One report from Ash-tabula County, Ohio, places it in the Transition zone, while eight persons in Oklahoma report it a standard variety in the Lower Austral, along the border of the Upper Austral. The reports, however, from Oklahoma, indicate unprofitable culture. *Bloody Butcher* is clearly an Upper Austral variety grown mainly in Indiana, Illinois, Iowa, Kansas, and Nebraska.

(6) *Golden Dent*.—Thirty-three persons report this variety from sixteen States. It is reported mostly from the Lower Austral zone in Texas, Louisiana, Arkansas, Mississippi, Alabama, Georgia, Florida, North Carolina, and South Carolina. It is also reported from the Upper Austral in Arkansas, Illinois, North Carolina, South Carolina, Ohio, Virginia, West Virginia, Pennsylvania, and New Jersey. One New Jersey correspondent writes that it is uncertain in ripening in Morris County. *Golden Dent* is evidently well suited to the Lower Austral zone, though it may do well in the Upper Austral if not carried too far toward the Transition.

(7) *Hickory King*.—Sixty-one persons report this variety grown in twenty-two States and Territories, in the main, in the lower part of the

Upper Austral zone, and in the Lower Austral in Louisiana, Mississippi, Alabama, Texas, and Oklahoma. The reports from the Lower Austral are, however, generally unsatisfactory in productiveness, and do not indicate a high yield. The reports from the Upper Austral indicate that it is better adapted to the lower part of that zone, especially in Indiana, Kansas, Kentucky, Missouri, Nebraska, Virginia, West Virginia, and Delaware.

(8) *Leaming*.—This is one of the very best known, most widely grown, and most productive of the Dent corns. A number of correspondents report having grown it as long as twenty-five years. One hundred and thirty-one persons state that this variety is grown, with minor exceptions, in the Upper Austral zone up to its northern border, especially in Ohio, Indiana, Illinois, Iowa, Arkansas, Kansas, Nebraska, Pennsylvania, Maryland, and New Jersey. *Leaming* is reported as ripening all over Massachusetts, except in Suffolk, Barnstable, and Nantucket counties, although it is very unlikely that it will ripen anywhere in the Transition. It is said to yield well in Dakota County, Minn., which is near the boundary of the Upper Austral zone. Reports from New Mexico, Utah, Idaho, and Colorado also seem to come from points within the Upper Austral. Eight reports show that it yields crops in Texas, Oklahoma, Louisiana, Mississippi, and Alabama, all in the Lower Austral, but as a rule the yields are much inferior to those in the Upper Austral, to which zone this variety clearly belongs. (See fig. 1, p. 11.)

(9) *Mosby's Prolific*.—This variety seems to be quite restricted in geographic distribution, thirty-two persons reporting it from five States—Alabama, Arkansas, Louisiana, Mississippi, and South Carolina. But one report was received from Arkansas, one from South Carolina, while thirty came from Louisiana, Mississippi, and Alabama. These reports, with the exception of that from South Carolina, are all from the Lower Austral zone, to which *Mosby's Prolific* is evidently best adapted.

(10) *Pride of the North*.—This is one of the few Dent varieties that seem adapted to the border of the Upper Austral and Transition zones. Sixty-two persons report that it is grown successfully in nineteen States and in the province of Ontario. With five exceptions, all these points are in the more northern States, notably Massachusetts, New York, Ohio, Indiana, Illinois, Iowa, Nebraska, South Dakota, Minnesota, Wisconsin, and Michigan. *Pride of the North* is reported in the Transition zone in northern South Dakota, at three points in Minnesota, at a number in Wisconsin, at one in Ohio, and at one in Ontario. It is reported to succeed all over Massachusetts, except Suffolk, Barnstable, and Nantucket counties, but it is doubtful if it will ripen outside of the valleys in that State. This variety does best in the Transition and along the upper edge of the Upper Austral zones. (See fig. 1, p. 11.)

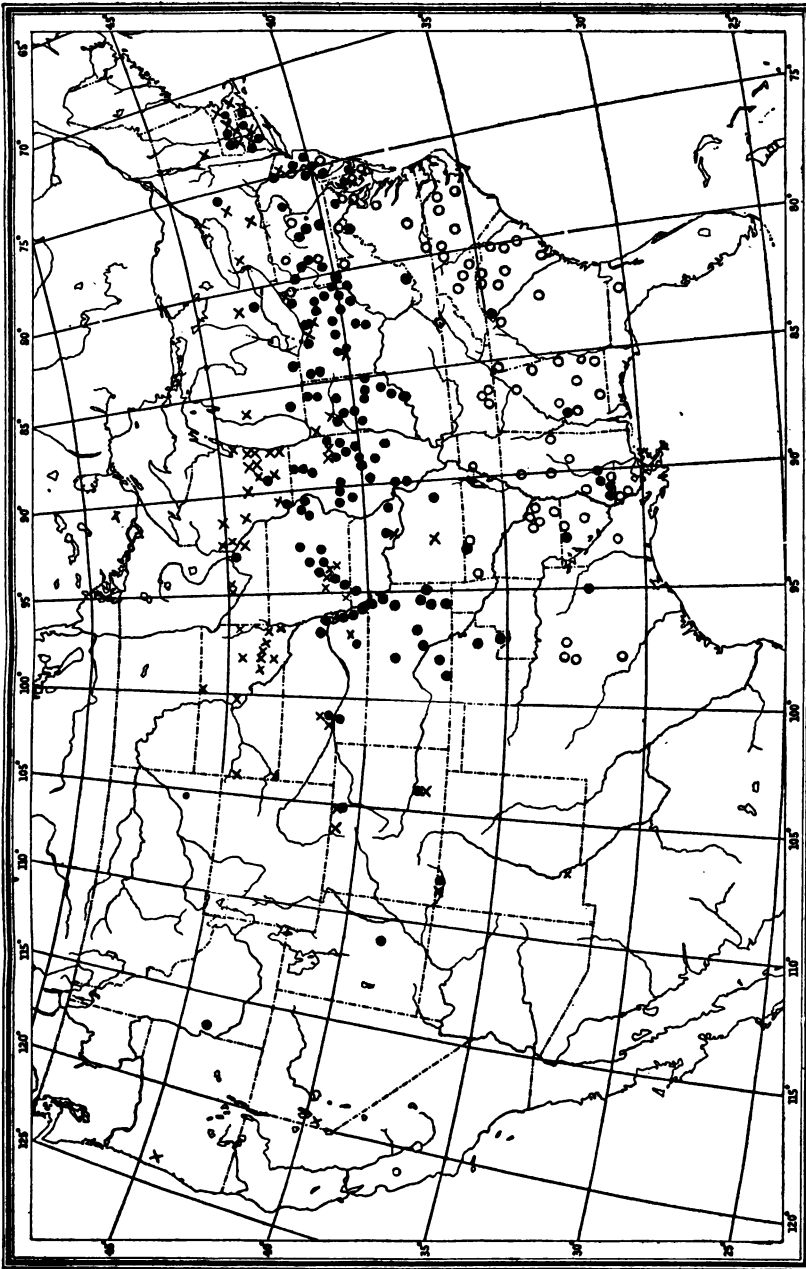


FIG. 1.—Map showing distribution of three varieties of Corn: Cross (+) = Pride of the North. Spot (●) = Leaning. Circle (○) = White Gourd Seed.

(11) *St. Charles White*.—This is quite a well-known variety in the Mississippi Valley States south of Iowa. Twenty-three persons report it from seven States and Oklahoma. Three reports from southern Oklahoma, northern Louisiana, and southern Alabama, come from the Lower Austral zone, the other twenty from the lower part of the Upper Austral, in Kansas, Missouri, Arkansas, Illinois, Tennessee, and northern Alabama. *St. Charles White* may be regarded as an Upper Austral type since two of the three yields reported from the Lower Austral (Louisiana and Alabama) can hardly be regarded as within the limits of successful or profitable culture.

(12) *White Gourd Seed*.—This variety is also known as Gourd Seed, Improved Gourd Seed, Southern Gourd Seed, Big Gourd Seed, Large Gourd Seed, etc. It is essentially a southern corn, that is generally grown in the Gulf and lower Atlantic seaboard States. Sixty-nine reports on it were received from seventeen States, including one each from California, Ohio, and Florida. In the Lower Austral zone *White Gourd Seed* succeeds in Texas, Louisiana, southern Arkansas, western Tennessee, Mississippi, Alabama, Florida, Georgia, South Carolina, and North Carolina. In the Upper Austral it succeeds in northern Arkansas, central and eastern Tennessee, northern Georgia and South Carolina, western North Carolina, Virginia, West Virginia, New Jersey, and Pennsylvania. While grown much more in the Lower than the Upper Austral, the best yields are reported from the latter zone. There is one report from the Transition zone (*Ashtabula County, Ohio*), where the seed, I think, must be planted for fodder or silage. This variety seems to be adapted to successful growth not far from the boundary between the Upper and Lower Austral zones. (See fig. 1, p. 11.)

(c) SOFT CORN.

(13) *Squaw*.—No other Indian corn will mature seed so far north as will this variety. It is reported to have been grown by the Indians, particularly in the Northwest, from times antedating the settlement of the country by the whites. Fifty-two persons reported on it from twelve States and six Canadian provinces, and all of the localities except four are west of the Mississippi River. In the Upper Austral zone it is reported from New Mexico, Nevada, Kansas, Nebraska, South Dakota, Wyoming, Montana, and Idaho. In the Transition it is reported as maturing seed in Flathead, Missoula, and Lewis and Clarke counties, Mont.; in North Dakota and the northern part of South Dakota; in northwestern Minnesota and southern Michigan. In the Canadian provinces it is reported to mature seed at Glencross and Grund, Manitoba; in the Kettle River district, British Columbia; and at Danville, Quebec. Most reports from the Canadian Northwest, Quebec, and Nova Scotia, however, state that it is only grown as garden stuff, and many indicate that it is only raised for green fodder for

live stock. George Martin writes from Saltcoats, eastern Assiniboia, "We are too far north to grow ensilage corn with success." Squaw corn does not mature in Manitoba at Turtle Mountain, Pembina, or Winnipeg, nor at Spy Hill, Assiniboia. It is doubtful if it can be depended upon to mature a crop above the Transition, to which zone it properly belongs.

(d) SWEET CORN.

(14) *Stowell's Evergreen or Evergreen Sweet*.—Comparatively few notes were received on Sweet or Sugar corn, but as thirty-six persons reported from twenty-eight States, it is thought best to touch upon the distribution of this variety. Sweet corn is essentially successful in the Upper Austral, maturing generally in this zone. No report on Stowell's Evergreen was received from the Transition, except from one point each in northwestern Pennsylvania, southern Wisconsin, northeastern South Dakota, eastern North Dakota, and southern Montana. It was reported from four points in the Lower Austral, in Louisiana, Mississippi, and Alabama. It does not do well, however, in the Lower Austral, and its successful cultivation may be said to be restricted largely to the Upper Austral zone.

(e) POP CORN.

(15) *All varieties*.—No one variety of pop corn was specified to any extent by the twenty-five persons reporting from fifteen States and two Canadian provinces. No reports are at hand from the Lower Austral. Nearly all are from the Upper Austral, except the following from the Transition zone: One from Keremeos, British Columbia; one from California; one from Howard, S. Dak.; one from Upper Quebec, and one from Maine. This is really an Upper Austral crop, not coming to its fullest powers in either the Lower Austral or the Transition.

WHEAT.

All of the wheats under consideration belong to the species *Triticum sativum*, and for the purpose of this work may be divided into two groups, winter and spring, as follows:

GROUPS AND VARIETIES.

(a) WINTER WHEAT.

- (1) Clawson.
- (2) Fulcaster.
- (3) Fultz.
- (4) May.
- (5) Mediterranean.
- (6) Turkey.
- (7) Velvet Chaff.

(b) SPRING WHEAT.

- (8) Australian.
- (9) Ladoga.
- (10) Saskatchewan Fife.
- (11) Scotch Fife or Fife.
- (12) Sonora.
- (13) Red Fife.

NOTES ON THE GROUPS AND VARIETIES.

The above-mentioned varieties are shown by the reports to be distributed as follows:

(a) WINTER WHEAT.

(1) *Clawson*.—Reports from fifty-five correspondents in nineteen States localize this variety entirely within the Upper Austral and Transition zones. It seems best fitted for the Upper Austral, but thrives also in southern parts of the Transition, in Pennsylvania and Massachusetts. This is due to the wheat having been planted in the upper Ohio and Connecticut River valleys, which traverse the Transition zone.

(2) *Fulcaster*.—Reports from ninety-five correspondents in twenty States limit this variety mainly to the Upper Austral. It is reported, however, from three counties in northern Texas, five in Oklahoma, and one in Mississippi, all in the Lower Austral zone. In Pennsylvania, it touches the Transition, although usually in valleys where Upper Austral conditions prevail.

(3) *Fultz*.—Reports on this variety were received from two hundred and twenty-five correspondents scattered over thirty States. This is the most extensively grown variety of wheat reported on, being raised from the Atlantic almost to the Pacific, and from the Gulf States to those bordering the Great Lakes. Its successful cultivation, however, is mainly restricted to the Upper Austral zone. Here it grows in upper Mississippi and some parts of Alabama, at three points in Texas, seven in Oklahoma, and seven in Tennessee. In the North, at one point in southwestern Wyoming (Evanston), at two in western Montana (Plains and Springhill), at two in Wisconsin, and at a number of points in northeastern Ohio, Pennsylvania, and New York it seems to make successful growth within the Transition zone. Along the Alleghanies, in Tennessee, North Carolina, West Virginia, and Virginia it succeeds in Upper Austral valleys. The general reports of correspondents indicate that it does not find the most successful conditions in the Lower Austral, although, with one exception, reports from Oklahoma are excellent. Fultz really belongs to the Upper Austral and has been grown in many localities in this zone from twenty to thirty years with much success.

(4) *May*.—This variety, or one closely related to it, is also known in some localities by the names of Red May, Little May, Big May, Early May, and Late May. Reports were received from sixty-four correspondents in fourteen States, from points in either the Upper or Lower Austral, usually the latter, but none from localities in the Transition zone. May wheat seems to be grown most extensively in Alabama, Arkansas, Georgia, Kansas, Mississippi, Oklahoma, South Carolina, and Texas. Except in Kansas, two points in south and central Illinois,

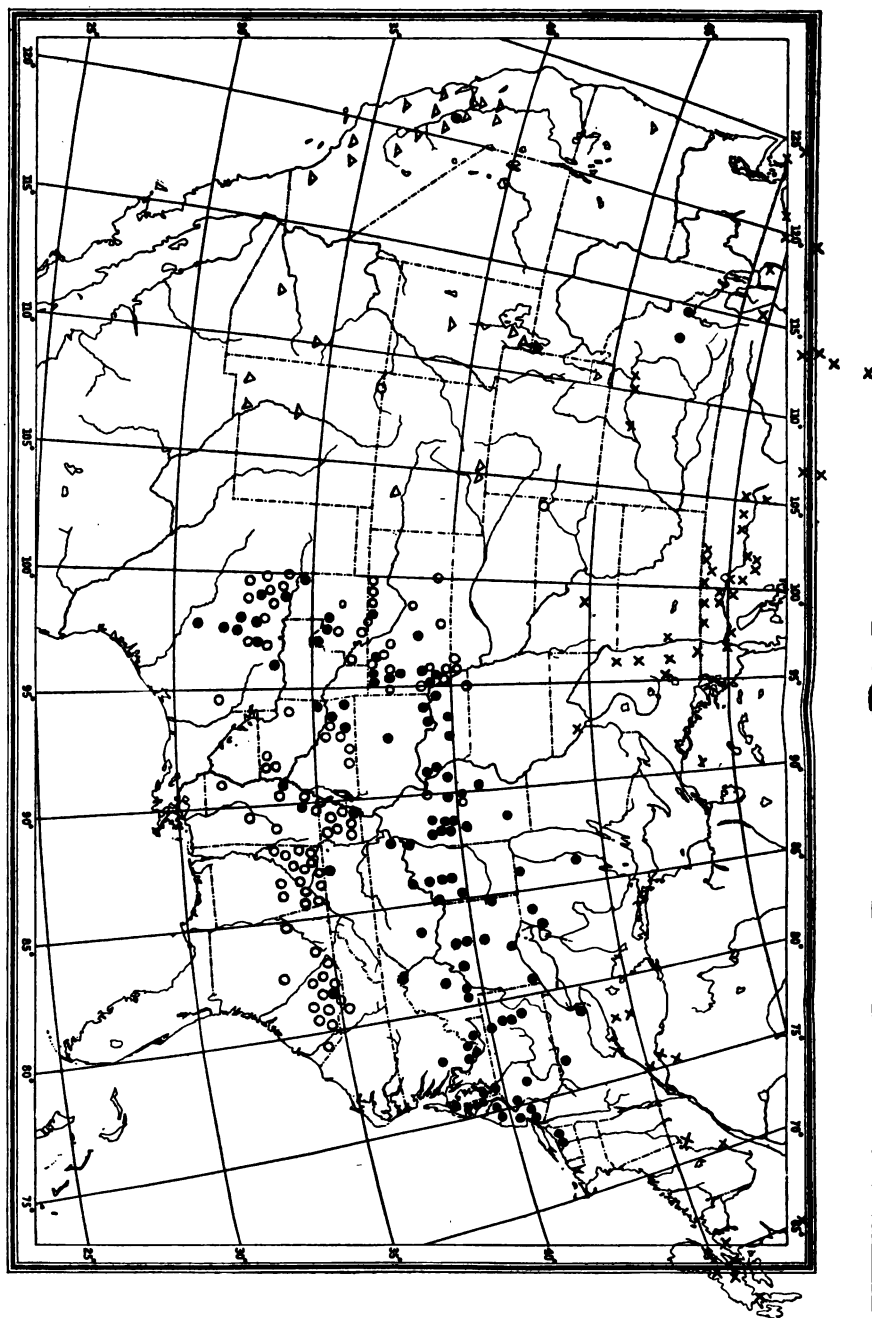
one in extreme northwestern New Mexico, and one in the southwest corner of South Dakota, all in the Upper Austral, this variety is best known along the line where the Upper and Lower Austral overlap, apparently favoring the latter zone. It is unquestionably the best known variety which seems at all suited to the higher temperatures of the Lower Austral. (See fig. 2, p. 16.)

(5) *Mediterranean*.—This is one of the oldest and best known varieties of wheat that has been grown in the United States, having been introduced in this country in 1836. It has a long bearded panicle and the grain is amber or red in color. This wheat must not be confounded with Mediterranean Hybrid or any other recently introduced variety with the word Mediterranean forming part of the name. One hundred and three correspondents from twenty-three States reported on it from points almost entirely in the Upper Austral zone. It was reported as growing quite successfully in ten counties in northern Texas and four in southern Oklahoma, which are located in the Lower Austral. It was also noted at one point in California and two in Montana in the Upper Austral, and even reached the Transition at one locality in northeastern Ohio, and one in southern New York. With these exceptions all the reports come from the Upper Austral. (See fig. 2, p. 16.)

(6) *Turkey Red*.—This variety is known under a number of names, as Turkey, Turkey Red, Turkish, etc. Fifty-six correspondents report it grown in Colorado, Illinois, Iowa, Kansas, Missouri, Nebraska, and Oklahoma. The reports show it to be entirely restricted to the Upper Austral zone except along the border of the Lower Austral in southern Oklahoma. This variety is principally raised in Kansas, where it has been grown for fifteen or twenty years, and is still a general favorite.

(7) *Velvet Chaff*.—There are two types of wheat having this name, one being grown somewhat as a spring wheat in the Northwestern States, and the other as a winter variety, mainly in the Central West. This report relates to the winter variety. Velvet Chaff is of four kinds, irrespective of the above distinction. The panicles are divided into two classes, bronze and white, and each of these into two groups, bearded and beardless. A characteristic of each variety, which gives it its name, is the presence of a silvery pubescence on the glumes. No distinction between these four varieties is recognized in considering their geographic distribution. Forty-eight correspondents, representing fourteen States and Oklahoma, and Ontario, Canada, reported on this wheat. It is restricted almost entirely to the Upper Austral, except at one point in the Saginaw region of Michigan in the Transition zone, and three points in southern Oklahoma in the upper portion of the Lower Austral zone. One report from Moscow, Idaho, really comes within the Upper Austral on account of the valley conditions there. Velvet Chaff seems best known in Ohio, Indiana, and Illinois, and is reported to have been grown in Ohio for forty years.

Fig. 2.—Map showing distribution of four varieties of Wheat: Cross (+) = Red Fife. Spot (●) = Mediterranean. Circle (○) = May. Triangle (△) = Sonora



(b) SPRING WHEAT.

(8) *Australian*.—This is also known as Australian Club and White Australian. It was reported by twenty-eight correspondents as growing in nine States and Territories, and in British Columbia close to the Washington line. It is adapted to the Upper and Lower Austral zones. In California, where it is grown more than elsewhere, it succeeds nicely in the hot San Joaquin and Sacramento valleys, which lie within the Lower Austral. The only report which might seem out of the uniform geographic location is the one at Hazelmere, in Westminster district, British Columbia, which seems to come within the Transition zone. One report from Ohio appears to be a case of a variety improperly named, which really belongs to the winter class.

(9) *Ladoga*.—This variety was introduced from Russia by Prof. William Saunders, of the Central Experimental Farm at Ottawa, Canada, some ten years ago. Its distribution has been entirely in the British provinces. Of thirty-two correspondents only one reports it from the United States (at Bozeman, Mont.), the others being distributed over Alberta, Assiniboia, British Columbia, Manitoba, Saskatchewan, New Brunswick, Nova Scotia, and Ontario. All of these points seem to fall within the Transition, excepting those in British Columbia, Alberta, and Saskatchewan, which latter localities are apparently in the southern part of the Boreal zone. Large yields are reported from these regions, and Mr. C. W. Drayton, at Fort Saskatchewan, reports that it has been known there for eight years, and yields 40 bushels per acre.

(10) *Saskatchewan Fife*.—This is reported from twenty-five points in seven of the Northwestern States and at one point in Alberta. It is grown in greatest amount in North and South Dakota, Minnesota, Nebraska, Wyoming, and Montana, and evidently most successfully in the Transition zone. It is reported from one locality in Alberta (Lewisville), which seems to be within the Boreal.

(11) *Scotch Fife or Fife*.—Correspondents report on this variety at eighty points, mainly in the Transition zone, in Wisconsin, North and South Dakota, Wyoming, Montana, Colorado, Ontario, Quebec, and New Brunswick. It is also reported in southern Manitoba and British Columbia in the Transition, in Alberta at two points in the Boreal, and in Nebraska at four points and Iowa at three points in the Upper Austral. The main evidence, however, shows that it is best suited to the Transition.

(12) *Sonora*.—Twenty-five persons report this variety from the following seven States and Territories: Arizona, California, Colorado, Idaho, New Mexico, Oregon, and Utah. Sonora is one of the commonest varieties of wheat cultivated in California, where it is extensively grown in the Lower Austral. In Arizona, also, it is grown in the Lower Austral, but elsewhere seems to be confined to the Upper Austral. (See fig. 2, p. 16.)

(13) *Red Fife*.—Seventy-three correspondents represent this variety as mainly grown in the British provinces in the Transition zone. It was reported by only seven observers in the United States, two in Minnesota, three in Montana, one in North Dakota, and one in South Dakota. The points in South Dakota and Montana seem to approach the Upper Austral. In British Columbia, Alberta, and Saskatchewan Red Fife seems to do well in the Boreal region. Its most extensive and successful culture, however, is in the Transition zone. (See fig. 2, p. 16.)

OATS.

All of the oats reported upon belong to the species *Avena sativa*, or the common oat. The seven varieties listed may be divided into two general classes, and these into minor groups with individual peculiarities, as follows:

GROUPS AND VARIETIES.

(a) OPEN PANICLE OATS.

Long, yellowish-white seed.

(1) American Banner.

(2) Lincoln.

Short, yellowish-white seed.

(3) Welcome.

Long, brownish or dun colored seed.

(4) Burt.

(5) Red Rust Proof.

(b) CLOSED PANICLE OATS.

Yellowish white seed.

(6) White Russian.

Brownish or black seed.

(7) Black Tartarian.

NOTES ON THE GROUPS AND VARIETIES.

The above-named varieties are found growing most successfully within certain zones, as shown below:

(a) OPEN PANICLE OATS.

(1) *American Banner or Banner*.—One of the best-known varieties grown in the Canadian provinces. Reports were received from eighty persons, seventy-six being from Canada, two from Idaho, one from Washington, and one from Nebraska. The reports from the United States are in the Upper Austral, but from Canada mainly in the Transition zone. There are two exceptions, however; in southern Ontario this oat reaches the Upper Austral, while in Saskatchewan, Alberta, and British Columbia it succeeds in the Boreal zone, 60 and 70 bushels per acre being reported from Fort Saskatchewan and Innisfail, and good yields in the other regions. The notes from western Nebraska are not entirely satisfactory, for while this oat is reported

as succeeding in Lincoln and Logan counties, no yield is given, and it would hardly be expected to do well in this region.

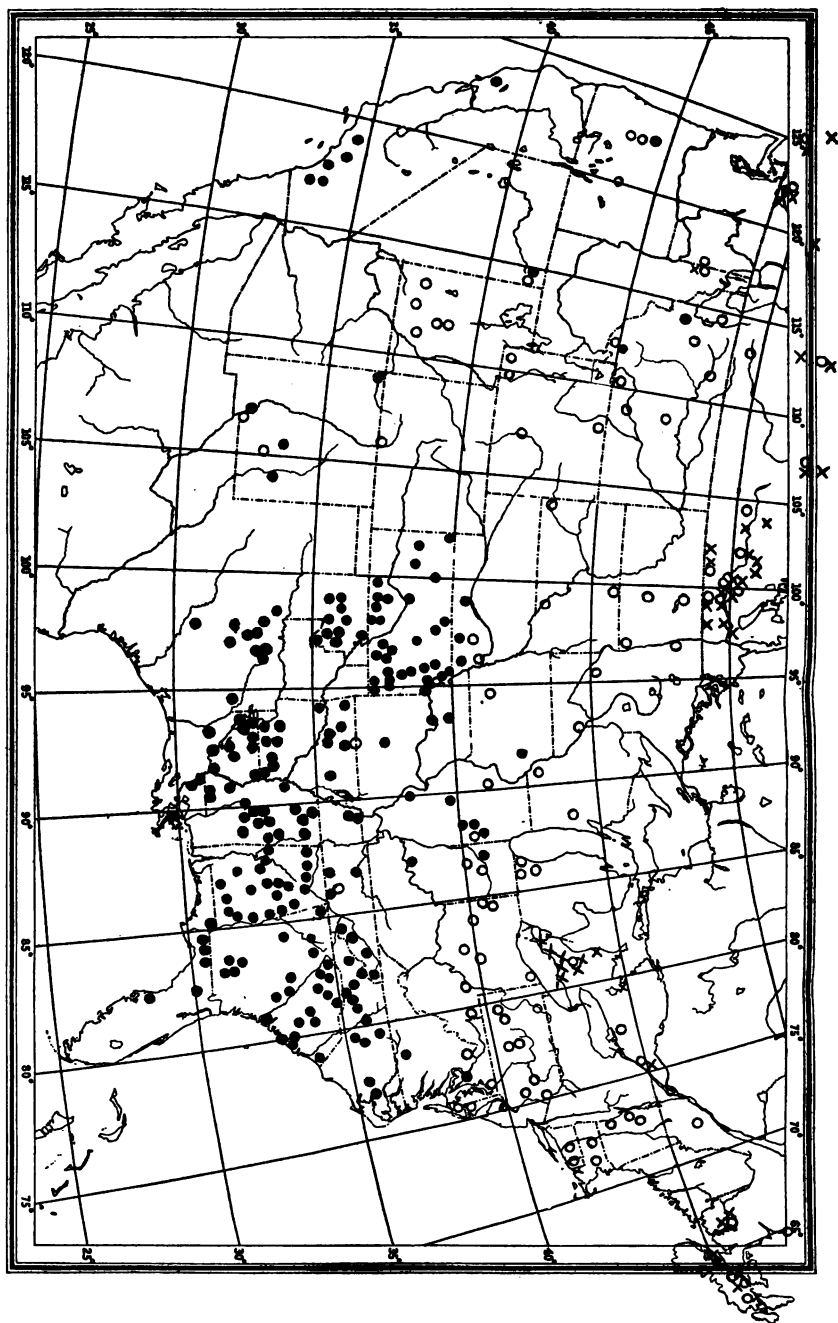
(2) *Lincoln*.—This is one of the most recently introduced varieties, having been before the public some five or six years. It has been widely distributed, and has been received with much favor. Sixty-seven persons reported it from twenty-three States and Territories and from five Canadian provinces, showing it to be very largely grown in the Transition and Upper Austral zones. In the Transition it succeeds in the Dakotas, Minnesota, Wisconsin (about Green Bay), Nova Scotia, New Brunswick, British Columbia, Assiniboia, Manitoba, northern Montana, Ohio (Ashtabula County), and eastern Ontario (Glengary County).

(3) *Welcome*.—One hundred and two persons reported on this variety, from twenty-nine States and eight Canadian provinces. These reports clearly show it to succeed in the Upper Austral and Transition zones, while reports from two points in Alberta, one in Saskatchewan, one in Quebec, and five in New Brunswick and Nova Scotia show that it will produce good crops in the Boreal region. It is commonly grown all over the country north of the Ohio River, in the northern parts of the central and far West. This oat is one of the best known in the United States, and has been sold under the names of White Australian and White Belgian. (See fig. 3, p. 20.)

(4) *Burt*.—This variety is rather locally grown, not being known over a wide territory. Thirty-five persons report it very largely from the Lower Austral zone. It does well generally in Mississippi, Alabama, Georgia, South Carolina, and northern Florida—in Jackson and Leon counties. It grows to some extent in the lower part of the Upper Austral in northern Alabama, Georgia, South Carolina, and middle and eastern Tennessee, and in Washington County, Ind., where the single report shows that it is unsatisfactory as regards yield. It clearly belongs to the Lower Austral zone.

(5) *Red Rust Proof* or *Texas Red Rust Proof*.—Reports from two hundred and one persons, residing in twenty-two States and Territories, show this oat to be of very wide distribution. It is by far the best-known variety of any grown in the Southern States, and will produce a satisfactory crop when others are completely ruined by the common oat rust. Its yielding powers are satisfactory, so that it has gradually found its way from the Lower to the Upper Austral zone. It is generally grown in Texas and the Southern States, while for a dozen years or so it has been extensively grown in Kansas. It succeeds well in North Carolina, Tennessee, Oklahoma, Arkansas, Missouri, southern Iowa, Illinois, and Indiana. It is also reported as grown in the Upper Austral in California, Oregon, Nevada, Montana, New Mexico, and Maryland. It is certainly well adapted to both the Lower and Upper Austral, especially the former. (See fig. 3, p. 20.)

FIG. 3.—Map showing distribution of three varieties of Oats: Cross (X) = Black Tartarian. Spot (●) = Red Rust Proof. Circle (○) = Welcome.



(b) CLOSED PANICLE OATS.

(6) *White Russian*.—Reports were received from one hundred and eighty-four persons, distributed over thirty-three States and Territories and seven Canadian Provinces. Generally speaking this variety is cultivated almost entirely in the Transition zone, where it reaches its best and most profitable development, the reported yields ranging from 35 up to 100 bushels per acre. It is much more largely grown than all other varieties together in the Northwest, in the Dakotas, Minnesota, Montana, Manitoba, Assiniboia, Alberta, and British Columbia. It is reported as grown to a considerable extent in Michigan, Wisconsin, Nebraska, Wyoming, Utah, Kansas, Colorado, Ontario, New Brunswick, northern New England, West Virginia, northern Indiana, northern Illinois, Ohio, and Oregon. It is also reported from Arizona, New Mexico, Texas, Oklahoma, Louisiana, Arkansas, South Carolina, and Delaware.

Along the border of the Upper Austral and Transition zones this oat does very well, but where reported from the Lower Austral, with the exception of Louisiana, it is not grown with success. The point in Louisiana is in West Carroll Parish, and probably the correspondent names it incorrectly, for from no other point in the Lower Austral have satisfactory reports been received of the growth of the large white varieties of oats. They can not withstand the climatic conditions. Two reports from upper Alberta and seven from New Brunswick and Nova Scotia indicate the successful growth of white Russian oats in the Boreal region; in fact the largest yield reported (100 bushels per acre) is from Nova Scotia, which station, however, probably lies within the Transition zone.

(7) *Black Tartarian*.—Forty-nine correspondents report this variety from Idaho and eight Canadian Provinces. It seems to grow with success in the higher Upper Austral, all through the Transition, and in the Boreal zone. In Ontario it succeeds along the north shore of Lake Erie in the Upper Austral, while in British Columbia, on Vancouver Island, and in Saskatchewan, at Saskatoon and Osler, fair crops are secured. Its most extended cultivation seems to be in eastern Assiniboia, southern Manitoba, and Nova Scotia. It is really best adapted to the Transition zone. (See fig. 3, p. 20.)

DISTRIBUTION OF CEREALS BY ZONES.

The following table shows the distribution by zones of the cereals mentioned in this report:

Distribution of Cereals by Zones.

Zone.	Cereal.	Group.	Variety.
Lower Austral	Corn.....	Dent.....	Mosby's Prolific.
	Oats.....	Open Panicle	Burt.
	Corn.....	Dent.....	Golden Dent.
Border of Upper and Lower Austral.	Corn.....	Dent.....	Hickory King.
	Corn.....	Dent.....	White Gourd Seed.
	Wheat.....	Winter	May.
	Wheat.....	Spring.....	Australian.
	Wheat.....	Spring.....	Sonora.
	Oats.....	Open Panicle	Red Rust Proof.
	Corn.....	Dent.....	Bloody Butcher.
	Corn.....	Dent.....	Leaming.
	Corn.....	Dent.....	St. Charles White.
	Corn.....	Sweet.....	Stowell's Evergreen.
Upper Austral	Corn.....	Pop.....	All varieties.
	Wheat.....	Winter	Clawson.
	Wheat.....	Winter	Fulcaster.
	Wheat.....	Winter	Fultz.
	Wheat.....	Winter	Mediterranean.
	Wheat.....	Winter	Turkey Red.
	Wheat.....	Winter	Velvet Chaff.
	Corn.....	Flint	Angel of Midnight.
	Corn.....	Flint	Canadian Eight-rowed Yellow.
	Corn.....	Flint	King Philip.
Border of Upper Austral and Transition.	Oats.....	Open Panicle	Lincoln.
	Oats.....	Open Panicle	Welcome.
	Oats.....	Closed Panicle	White Russian.
	Corn.....	Flint	Longfellow.
	Corn.....	Soft	Squaw.
	Wheat.....	Spring.....	Ladoga.
	Wheat.....	Spring.....	Saskatchewan Fife.
Transition	Wheat.....	Spring.....	Scotch Fife or Fife.
	Wheat.....	Spring.....	Red Fife.
	Oats.....	Open Panicle	American Banner.
	Oats.....	Closed Panicle....	Black Tartarian.
	Oats.....	Closed Panicle....	

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